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Taxonomy, ecology and descriptions of the larva, pupa and adult of the Australian hispine beetle, *Eurispa vittata* Baly

(Insecta, Coleoptera, Chrysomelidae)

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The biology, host plant, larva, pupa and adult and other features of the Australian hispine beetle, *Eurispa vittata* Baly (Coleoptera, Chrysomelidae, Hispinae) are described. The species is apparently monophagous on the native sedge, *Gahnia sieberiana* Kunth (Cyperaceae: Monocotyledonae) growing in heathlands in New South Wales. The larva of *Eurispa* differs from the larvae of other described Hispinae in the Australo-Papuan region by having a very slender body without lateral processes and in the shape of the pronotum and the caudal processes of the abdomen.

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Introduction

The Hispinae are a major subfamily of the Chrysomelidae, most of which feed as adults and larvae on leaves of monocots such as the Poaceae and Arecaceae (Jolivet 1989, Macedo et al. 1994, Jolivet & Hawkeswood 1995). The Hispinae are mostly distributed in the tropical and subtropical regions of the world (e.g. Seeno & Wilcox 1982, Jolivet 1989) but there appear to be very few species recorded from Australia, despite the abundance of tropical and subtropical regions and suitable host plants. Almost nothing has been recorded on the biology and distribution of the Hispinae known from Australia.

During 1991, the first author provided preliminary observations on the biology and host plant of one species from Australia, namely *Eurispa vittata* Baly, which is very closely associated with the native sedge, *Gahnia sieberiana* Kunth (Cyperaceae) (Hawkeswood 1991). The genus *Eurispa* Baly belongs to the tribe Eurispini and is grouped with the genera *Leucispa* Chapuis from Australia and *Squamispa* Maulik from India (Seeno & Wilcox 1982). Nothing appears to have been recorded on the host plants and biology of the latter two genera (Jolivet & Hawkeswood 1995). All of the presently available data on the adults, larvae, pupae, host plants and ecology of *E. vittata* are recorded below. The larva, pupa and adult are described in detail because the species, although common, is poorly known and adequate descriptions of its life stages are lacking.

Observations

Study site

Most of the material used for our study of *E. vittata* has been collected from the township of Hastings Point, north-eastern New South Wales, Australia (c. 28°20'S, 153°35'E). The vegetation of the Hastings Point area has been greatly disturbed during the past decades by sand-mining, agriculture and clearing for residential developments, but there are still a few small areas that have not been disturbed or have been disturbed only slightly and which contain stands of healthy, native vegetation. The site where the majority of the material of *E. vittata* was collected consists of *Banksia* heathland merging into *Eucalyptus* woodland on the southern and western margins. Most of this vegetation occurs on a vacant block of land owned by a national telephone company and continues westwards to the base of a hill where the *Eucalyptus* woodland is better developed on the higher, better drained and deeper soils. The upper soil layers of the *Banksia* heathland habitat are mostly pale grey Holocene sands which are somewhat acid (pH=5.5-6.5) and severely leached. A number of small ephemeral creeks traverse the main study area, mostly from east to west. This area suffers bushfire damage about once every two to three years.

The vegetation of the *Banksia* heathland consists of the following main species: *Banksia aemula* R. Br., *B. robur* Cav., *Conospermum taxifolium* Sm., *Persoonia lanceolata* Andr., *P. virgata* R. Br. (Proteaceae), *Hibbertia* spp. (Dilleniaceae), *Ricinocarpos pinifolius* Desf. (Euphorbiaceae), *Acacia sophorae* (Labill.) R. Br., *A. suaveolens* (Sm.) Willd., *A. ulicifolia* (Salisb.) Court (Mimosaceae), *Aotus ericoides* (Vent.) G. Don, *Dillwynia retorta* (Wendl.) Willd., *Gompholobium virgatum* Sieb. ex DC., *Kennedia rubicunda* Vent., *Phyllota phylicoides* (Sieb. ex DC.) Benth. (Fabaceae), *Boronia falcifolia* A. Cunn. ex Lindley, *Zieria smithii* Andr. (Rutaceae), *Brachyloma daphnoides* (Sm.) Benth., *Epacris obtusifolia* Sm., *Sprengelia sprengelioides* (R. Br.) Druce, *Styphelia viridis* Andr. *(Epacridaceae)*, *Dampiera stricta* (Sm.) R. Br. (Goodeniaceae), *Sowerbaea juncea* Sm. (Liliaceae sens. lat.), *Patersonia sericea* R. Br. (Iridaceae), *Lomandra longifolia* Labill., *Xanthorrhoea* spp. (Xanthorrhoeaceae), *Theymitra* sp. (Orchidaceae), *Gahnia sieberiana* Kunth, *G. erythrocarpa* R. Br. (Cyperaceae), *Xyris gracilis* R. Br. (Xyridaceae), *Baeckea stenophylla* F. Muell., *Callistemon pachyphyllus* Cheel, *Eucalyptus* spp., *Leptospermum whitei* Cheel, *L. semibaccatum* Cheel, *L. laevigatum* (Sol. ex Gaertn.) F. Muell., *Melaleuca quinquenervia* (Cav.) S. T. Blake (Myrtaceae) and *Cassytha glabella* R. Br. (Cassythaceae).

Notes on the host plant of *E. vittata*, *Gahnia sieberiana* Kunth (Cyperaceae)

Gahnia sieberiana is a coarse, caespitose perennial herb, growing to about 1.5 metres in height, with solid, terete stems each having four nodes. The leaves are long-linear, up to 80 cm long, 8-20 mm wide, situated mostly at the base of the stems and have closed sheaths. They are protected with abundant silica cells, especially on the lateral margins, which cut the skin if touched even lightly. The inflorescence is paniculate, and each branch is subtended by a more or less leafy bract. The spikelets are numerous, generally with two flowers each, with only the upper one perfect and fertile. Each flower is without a perianth and has 3-6 stamens and with a trifid style. The plants produce a globular, red-brown nut. In the study area, *G. sieberiana* occurs in both habitats, i.e. the *Banksia* heathland and the *Eucalyptus* woodland, but mostly occurs in exposed to semi-exposed positions in the heathland on lower ground where the soil is often wet for some period of time, e.g. along the banks of the ephemeral creeks that traverse the area. The species is rather common on the hind dunes but residential and other developments in the Hastings Point area and elsewhere along the coast of north-eastern New South Wales are reducing the heathland and associated woodland habitats and numbers of *G. sieberiana* have been steadily declining over the past decade along with common and less common native plant species.

Methods

Collection of adults and larvae of *E. vittata* – plants of *Gahnia sieberiana* were randomly selected and examined for the presence of beetles at various times during 1991-1995 and observations recorded. General collecting of adults and larvae were undertaken. During November and December 1995, more extensive observations and collections were undertaken. The number of adults and larvae collected/

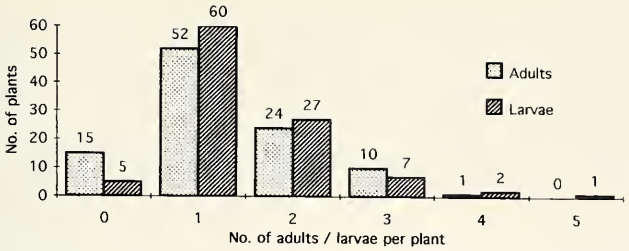

Fig. 1. Relationship between the numbers of adults and larvae (all stages) of *Eurispa vittata* Baly and the number of plants of *Gahnia sieberiana* Kunth (Cyperaceae) at Hastings Point, New South Wales, during November to December, 1995. (Graph: T. J. Hawkeswood & C. J. Parker).

observed from 102 plants of *G. sieberiana* were noted and a graph showing the numbers of adults and larvae (all stages grouped together) per plant was plotted (Fig. 1). All biological observations are described in the section following the descriptions of the life stages.

Descriptions

Eurispa vittata Baly

Eurispa vittata Baly, 1858: 86, plate II, Fig. 3; plate VII, Fig.1.
Eurispa vittata Baly (Figs 2a-h, 3a-d, this paper)

Adult male. Elongate, flattened, 9.5-11.5 mm long. Head black with deep purple reflections, deeply and coarsely punctate, each puncture with a short, stout silvery-golden seta; head about ¾ the diameter of the pronotum at the widest point; clypeus with long, silvery, anteriorly directed hairs; head in the lateral region developed forwards to cover part of the eye. Antennae black with purplish reflections, segment 1 almost globular, truncated at the basal margin to accommodate the shape of the head; segment 2 almost cylindrical, about twice as long as segment 1; segment 3 obconic, slightly narrower and longer than segment 2, wider at apex; segment 4 shorter, but longer than segment 1; segments 5 and 6 almost equal in size, obconic, about the same length as segment 1; segments 7-10 almost equal, thick and almost cylindrical; segment 11 same width at base as segments 7-10, then tapered in the ⅓ to ⅔ to a blunt point; segments 7-10 with a denser coverage of setae than the previous 6 segments. Pronotum about 1.2 times longer than wide, sub-parallel-sided but moderately constricted anterior to middle and weakly constricted anterior to base; deeply and densely punctured, more so at the lateral margins; with a mostly impunctate median central strip and a slightly raised impunctate area just anterior to middle. Scutellum black, subtriangular, impunctate, raised apically. Elytra about 4.0-4.5 times longer than the width of the body, glabrous, sub-parallel-sided, but weakly broadened behind middle; apex elongated, terminating in a long, sharp spine and a short, subapical sharp tooth; elytral disc very densely and regularly punctate, punctures situated in 10 longitudinal rows, the rows at the lateral margins very close to each other and sometimes merging; longitudinal sutural dark brown stripe extending to the third row of punctures laterally, longitudinal, narrow, marginal maroon-coloured stripe extending laterally from suture across puncture rows 6-9, both coloured stripes extending into the apical spine which is black at the tip from the mergence of these two coloured stripes. Underside of the body black, mostly glabrous and impunctate, with small and shallow punctures on the sides of the metathorax and on the abdominal segments mostly on the lateral and apical margins with a few on the basal (anterior) margin; prothorax densely and irregularly punctate; meso- and metathorax with wrinkles at the sides; a few scattered setae present on the lateral margins of the thoracic segments; apical sternite with dense setae at the apex. Legs shiny black with dense setae on the tibiae, setae less dense on the femora which have at least one area shiny and glabrous. Aedeagus narrow, parallel-sided, smooth, glabrous, non-wrinkled, c. 1.5 mm long, 0.15-0.2 mm wide, black, brownish-red at the apex, without dorsal and ventral longitudinal grooves, basal third (with basal piece) curved upwards to lie perpendicular to the rest of the aedeagus; apex acute; basal piece oval-shaped.

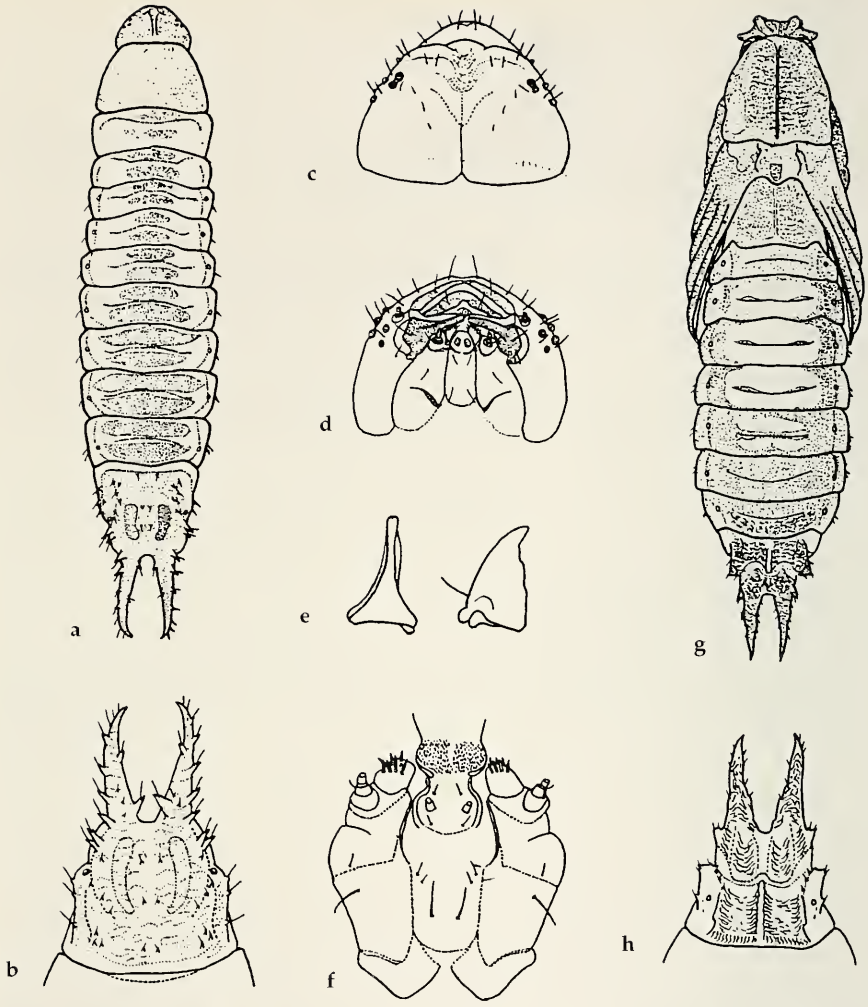

Fig. 2. *Eurispa vittata* Baly. **a-f.** Last instar larva. **a.** Dorsal view. **b.** Last abdominal segment showing caudal processes and spines **c.** Dorsal view of head showing position of ocelli and setae. **d.** Ventral view of head. **e.** Side and dorsal views of left mandible. **f.** Lower mouthparts. **g-h.** Pupa. **g.** Dorsal view. **h.** Last abdominal segment showing caudal processes. (Illustrations: H. Takizawa).

Adult female. Similar in morphology and colour to that of the male, but slightly longer, 12.5-13.0 mm long, and the sub-apical elytral tooth not as developed and acute as in the male.

Larva. Last instar larva (Figs 2a-f). Body (Fig. 2a) elongate, sub-parallel-sided without lateral processes, 12-13 mm in length, pale yellowish-brown with head, pronotum, two weakly transverse bands on each of meso– and metathorax, abdominal segments 1-7 and last abdominal segment slightly darkened (in alcohol preserved specimens). Head (Fig. 2c) prognathous, semicircular in outline, not deeply inserted into prothorax; coronal suture visible, frontal sutures poorly developed; frons markedly depressed and rugose along median line; clypeus well produced anteriorly, with a pair of longer setae medially; 5 or 6 ocelli present, well pigmented; antennae (Fig. 2d) short, two-segmented; labrum

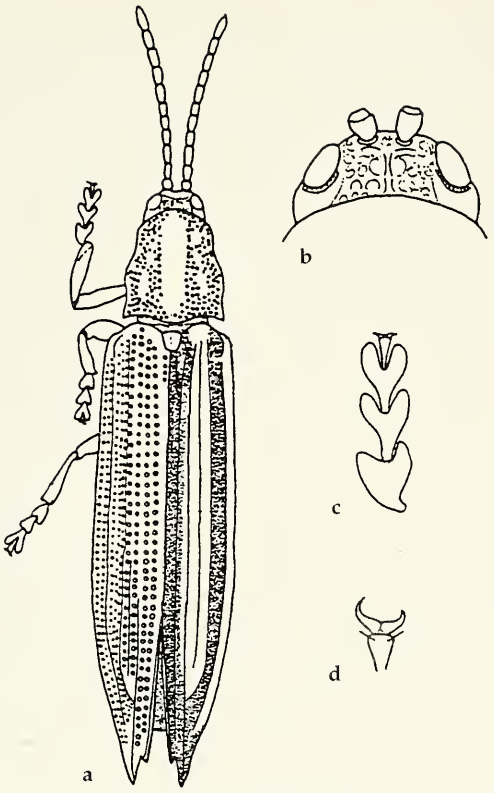

Fig. 3. Adult of *Eurispa vittata* Baly. **a.** Dorsal view. **b.** Close-up of dorsal part of head. **c.** Tarsus of left proleg. **d.** Close-up of tarsal claw of left proleg. (Illustration: H. Takizawa).

(Fig. 2d) weakly chitinized both basally and apically; mandible (Fig. 2e) flattened dorso-ventrally, with a narrow tooth; lower mouth-parts (Fig. 2f) very weakly chitinized, with mentum and maxillae almost fused together. Pronotum (Fig. 2a) evenly convex from side to side, with a row of microsetae along margin. Mesothorax, metathorax and abdominal segments 1-7 dorsally divided into two transverse areas (Fig. 2a), each with a median, transverse, darker, minutely wrinkled band; this band gradually widens from the lst to 7th segment; each abdominal segment dorsally with 6 or 7 microsetae; spiracles blackish, almost circular and prominently raised; last abdominal segment (Fig. 2b) entirely wrinkled, with a pair of longitudinal depressions which are raised laterally, surface of segment with numerous, small, brownish spinules and two pairs of larger teeth posteriorly to spiracle; caudal processes (Fig. 2b) stout, situated rather close to each other at base, gradually narrowed to acute apices, with about 5 or 6 larger spines. Legs stout and two-segmented, with a distinct pulvillus and claw.

Pupa. Mature pupa (Figs 2g-h). Body elongate, subparallel-sided without lateral processes, strongly chitinized and almost glabrous, 12-13 mm in length; caudal processes well developed; body light brown with venter and abdominal segments 2-5 medially yellowish-brown; head with a pair of small processes near base of antenna and with larger processes medially and laterally. Pronotum (Fig. 2g) almost as wide as long, narrowed anteriorly; pro– and metathorax transversely wrinkled on the dorsum. Abdominal tergite 1 (Fig. 2g) costate above spiracle; tergite 7 weakly wrinkled; last abdominal tergite costate longitudinally, laterally produced angularly at middle, with a pair of stout, straight apical processes; surface wrinkled with numerous minute spinules.

Specimens examined: 5 larvae, 3 pupae, 12 adults, Hastings Point, New South Wales, Nov.-Dec. 1995, T. J. Hawkeswood, from the foliage of *Gahnia sieberiana* Kunth (Cyperaceae) (TJH).

Field observations

Adults and larvae of *E. vittata* are usually found in the tight spaces between the basal unfolded parts of the leaves of the native sedge plant, *Gahnia sieberiana* Kunth (Cyperaceae). During mating, adults are often located and exposed on unfolded leaves at or near the ends of the leaves at the tops of plants. Young larvae are mostly found feeding on the newer, recently unfolded foliage in the centre of plants or amidst leaf bundles, at or near the tops of plants. They later crawl downwards towards the more tightly clustered leaves at the bases of plants. Wherever they feed, the larvae and adults chew extensive patches of mesophyll tissue between the parallel veins of the host plant leaves. These areas later become brownish in colour and are thus conspicuous on the plants. The mature larvae pupate at or near the base of the plant or leaf bundle between tightly clustered leaf bases. Adults are present concealed amongst the tight foliage for most of the year but numbers increase during the months of November to January but gradually decline again during February to April, reaching the lowest level during June and July. Adults which remain through the coldest months of May to September are most likely overwintering and possibly undergo some kind of dormancy as they are very sluggish when collected. Larvae are usually not present during the winter but young larvae first appear on the host plants during late October to early November. Eggs have not been observed in the field but are probably attached to dried leaves at the base of leaf bundles or more likely to foliage near the ends of leaves at the tops of the leaf bundles, from where the newly hatched larvae feed. Feeding by larvae and adults is usually extensive on several leaves per leaf bundle and occurs in one area for a period of time before they move to another area on the same leaf or an adjacent leaf. Flight was not observed and movement to other plants may not occur too frequently but when it does, the larvae and adults must crawl from one leaf to another one which is overlapping. No predation on larvae and adults by invertebrate or vertebrate predatörs has been observed, although an unidentified species of crab spider (Thomisidae) was common in the tightly folded leaf bases and a huntsman spider, *Isopeda* sp.(?) (Sparassidae) was also present, in lesser numbers, amongst tightly clustered or looser leaves. Either or both of these two spider species may be potential predators of the larvae or even the adults of *E. vittata*.

Examination of 102 plants of *G. sieberiana* during November to December 1995 revealed that about 15 % of all plants were devoid of adult beetles, about 51 % of plants possessed only one adult at the time of observation, about 24 % of all plants hosted a single pair of beetles (usually one of each sex), 8 % of all plants hosted 3 beetles each and only about 1 % of plants hosted 4 beetles (Fig. 1). No plants were found to possess more than 4 beetles (Fig. 1). The numbers of larvae per plant were similarly distributed to those of the adults (Fig. 1), but there was much variation in the ratio of no. of adults: no. of larvae per plant, e.g. one plant hosted five larvae but only one adult beetle, while many plants hosted only one larva and one adult (this was the most common combination). In addition, the highest numbers of adults and larvae were not necessarily found on the largest and most vigorous plants (c. 1.0-1.5 m high), e.g. occasionally large plants were totally devoid of larvae and adults, while smaller plants (0.2-0.4 m high) with lesser foliage, yielded up to 4 adults and 2 or 3 larvae.

Adults usually dropped to the ground or slid down the leaf blade towards the base of the plant if disturbed and were never observed taking or engaging in flight, even during hot, humid days. No regurgitation of food materials occurred, even when the beetles were handled. Mature larvae either remained on their host leaves when disturbed, or slightly curled up their bodies from head to abdomen before rolling or falling directly down the leaf to the base of the plant in a similar fashion to the adults. Examination of specimens of the related species of *Gahnia*, i.e. *G. erythrocarpa* R. Br., which tends to grow in discrete clumps in more shadier niches and is much rarer than *G. sieberiana*, as well as many specimens of grasses (Poaceae) in the study area, failed to produce any larvae, pupae or adults of *E. vittata*.

Discussion

Eurispa vittata is an attractive species of hispine beetle which appears to be monophagous on the leaves of *Gahnia sieberiana* (Cyperaceae), at least in eastern, coastal New South Wales. In an early published record, Froggatt (1907) briefly noted that members of the genus frequent sedges (Cyperaceae), while McKeown (1942) noted that *Eurispa vittata* often occurred in large numbers in swampy areas. Monteith (1970) and Lawrence & Britton (1994) also briefly noted that *Eurispa* are associated with sedges, but both references erroneously stated that grasses (Poaceae) are also utilized by these hispines as food. Examination of available Poaceae (e.g. *Themeda, Rhynchelytrum, Spinifex* and *Imperata)* as well as other sedges (e.g. *Gymnoschoenus, Caustis* – Cyperaceae) growing amongst and around the stands of *G. sieberiana* examined in this study, showed clearly that these plants were not being utilized as hosts by *E. vittata* nor for overwintering sites (as do other Australian Chrysomelidae which overwinter in plants which are not the normal trophic host, e.g. *Lilioceris fuscomaculata* Clark=*L. bakewelli* (Baly) (Hawkeswood 1987, LeBreton & Hawkeswood 1993). It can be safely stated that *E. vittata* does not utilise Poaceae either as food or resting/overwintering sites and its apparent strict monophagy on Cyperaceae is most likely to be found in other species of the genus. LeBreton & Hawkeswood (1993) also failed to find *E. vittata* utilizing *G. erythrocarpa* and in a recent review of the host plants of Chrysomelidae of the world, Jolivet & Hawkeswood (1995) have rejected Poaceae records for *Eurispa.*

Eurispa vittata is a common species of beetle, but is sparsely and patchily distributed within the heathland habitat at Hastings Point. Although few adults and larvae are present per plant (Fig. 1) at any one time of the year, the large number of *G. sieberiana* plants growing per unit area, especially along creeks and more moister areas, assures that the total population of *E. vittata* in any one region is large, and probably much larger than that of other chrysomelids or other Coleoptera in the same region or area (Hawkeswood, unpub. data). The particular plants of *G. sieberiana* selected by adults of *E. vittata* for colonization are not always the largest and most vigorous plants with the greatest number of choice leaves, but often small, young plants with limited foliage are selected. However, the size of the plant is not correlated with the degree of protection that is afforded to these flat-bodied beetles. Small plants are able to provide them with adequate protection and food and the limited amount of plant biomass allows better chances of mate location.

The hispine appears to be relatively long-lived with overwintering adults contributing to the next generation in the spring and summer. There is at least one generation per year and probably usually two.

The beetles appear to be adequately protected from predation by the closely sheathed, siliceous leaves of *G. sieberiana* and they do not apparently rely on defensive fluids from the mouth like other Chrysomelidae or the hispine *Mecistomela marginata* (Thunberg) (Macedo et al., 1994). According to Kalshoven (1957), Jolivet (1989) and Jolivet & Hawkeswood (1995), the Hispinae can be divided into four main groups based on larval feeding. *E. vittata* belongs to the first group, i.e. those species which live between the folded leaves of monocotyledons, between folded folioles of new fronds, at the base of petioles of palms (Arecaceae) or at the bases of crowns. Both adults and larvae of *E. vittata* are external leaf feeders which chew the epidermis and mesophyll parenchyma of the host, leaving whitish streaks which later brown with necrosis.

The larva of *E. vittata*, the first hispine larva to be fully described for the Australian fauna, is characterized by having a slender body without lateral processes, a head visible from above and the last abdominal segment with a pair of straight caudal processes. These distinguishing features of *Eurispa* larvae were described by Gressitt (1963) in a key to the species of larval Hispinae from the Australo-Papuan region. Unfortunately, Gressitt, although indicating that he had larval material of *Eurispa* to describe, did not eventually provide any descriptions in the 1963 paper nor in any of his subsequent papers. The larva of *Eurispa* is quite distinguishable from other Hispinae of the Oriental region in the character of the slender body without lateral processes. The larvae of most genera from the Australo-Papuan region have distinctive lateral processes on the sides of the body (Gressitt 1963).

It is interesting to ponder on and speculate as to why the Hispinae fauna of Australia is so depauperate in terms of species as compared to smaller neighbouring islands like New Guinea which have such a diverse fauna, and why the distribution of *E. vittata* encompasses heathlands from north-eastern New South Wales to Tasmania. Gressitt (1959, 1967) stated that the Papua New Guinea fauna, although having some endemic genera, e.g. *Ceratispa, Oxycephala* etc., is primarily related to the Malayan and Philippine faunas, and is thus Oriental. Gressitt (1959) also noted that only one true Australian genus, *Eurispa*, occurs in New Guinea, where it has only been found in Papua (south-east

New Guinea). By this statement, Gressitt has inferred that *Eurispa* has originated in Australia and has extended to New Guinea, where it has evolved into at least two species, but the reverse scenario could also be true. For some reason, Hispinae have not diversified in Australia to the extent that they have done in other tropical places such as New Guinea (even though Australia is close geographically to New Guinea) and South America. *Eurispa vittata* is an unusual species which has adapted to a climatic gradient (temperature and rainfall differences) from New South Wales to Tasmania. Gressitt (1959) made the interesting observation that hispine beetles (at least species from the Oriental Region), are less tolerant of cold than their host plants. This may explain why Hispinae are also largely absent from the southern areas of Australia and Tasmania and why the Chrysomelidae fauna of New Zealand is also very depauperate, i.e. these areas were already cold in the Tertiary when migration of ancestral Coleoptera from hotter, more equitorial regions occurred; these warm to hot tolerant species failed to adapt to the colder regions. *Eurispa vittata* seems to be a notable exception. However, most of the Australian Hispinae occur in the warmer northern half of the continent, e.g. *Promecotheca callosa* Baly from Cape York Peninsula and *P. varipes* Baly from Darwin, Northern Territory (Froggatt 1914). At least one of these northern tropical species, *P. callosa*, is also found in New Guinea. If *Promecotheca* and *Eurispa* were represented by more species in more regions over the Australian continent, it could be said that Australia is (was) the centre of diversification of these genera but since they appear to represented more strongly in New Guinea, this does not seem to be the case.

A lack of suitable host plants for evolving Hispinae cannot be proposed for the lack of speciation of Hispinae in Australia, because the main plant hosts of the subfamily in the Oriental region, i.e. Poaceae, Cyperaceae, Pandanaceae, Arecaceae, Araceae and Musaceae (with the possible exception of the last family), are well represented in the Australian flora. For instance, the Zingiberaceae are well represented in Australian tropical and subtropical rainforests, but as yet, no Chrysomelidae have been collected from them, yet *Alpinia*, *Elettaria* and *Zingiber* are hosts to many Chrysomelidae in New Guinea and elsewhere (e.g. Gressitt 1957, 1960, 1963, 1965; Kimoto et al. 1984; Schmitt 1988; Hawkeswood & Samuelson 1995, Jolivet & Hawkeswood 1995). Likewise, the Pandanaceae are well represented in Australia, especially in the northern parts of the continent, but only one species of hispine, *Promecotheca varipes* Baly has been recorded from *Pandanus* in Australia (Froggatt 1914). Pandanus is also well utilized by Chrysomelidae in New Guinea, the Solomon Islands and other Pacific regions (e.g. Gressitt 1957, 1960, 1963, 1965; Jolivet & Hawkeswood 1995).

Since *E. vittata* is monophagic on *Gahnia sieberiana*, this relationship is probably an ancestral one and most likely co-evolutionary. The Cyperaceae are an ancient group of Monocotyledonae and are well represented by many endemic genera in Australia, but most of these do not appear to have any Coleoptera/ plant associations. In Australia, the fossil pollen record shows that Cyperaceae appear first during the late Eocene (37-45 million years B. P.) in the Tertiary Period in northern Australia (White 1990). At the present state of knowledge, it is not possible to categorically state that *E. vittata* has been associated with *G. sieberiana* for that length of time, but fossils of both plant and insect (or their ancestors) need to be found to shed more light on the duration of this association. The fact that *E. vittata* feeds as larvae and adults only on *G. sieberiana* and refuses the foliage of closely related species of *Gahnia* such as *G. erythrocarpa* and other monocots growing in the same heathlands, indicates that the beetle may not be rapidly evolving to other hosts and may be at an evolutionary dead-end. The heathlands of New South Wales where the species inhabits are continually being cleared for residential, tourist and other developments. The specificity of *E. vittata* to its host and habitat means that it will become extinct in areas which are being decimated by humans. It is to be recommended that the remaining heathlands in New South Wales and other States be better protected since other fauna are likely to be as ecologically specific as *E. vittata*.

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